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The relationships between supplier development, commitment, social capital accumulation and performance improvement

Daniel R. Krause [a,*], Robert B. Handfield [b,1], Beverly B. Tyler [b,2]

[a] *Department of Supply Chain Management, W.P. Carey School of Business, Arizona State University, P.O. Box 874706, Tempe, AZ 85287-4706, USA*
[b] *CB 7229, College of Management, North Carolina State University, Raleigh, NC 27695-7229, USA*

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Abstract

This study investigates the relationships between U.S. buying firms' supplier development efforts, commitment, social capital accumulation with key suppliers, and buying firm performance. We identify linkages between supply chain management research on supplier development and organization theory research on social capital to consider how buying firm commitment to a long-term relationship, cognitive capital (goals and values), structural capital (information sharing, supplier evaluation, supplier development), and relational capital (length of relationship, buyer dependency, supplier dependency) are related to buying firm performance improvements (cost improvements, and quality, delivery, flexibility improvements). Analysis of buying firms from the U.S. automotive and electronics industries provides support for the theory that buyer commitment and social capital accumulation with key suppliers can improve buying company performance. Moreover, the findings suggest that the relationships of structural and relational capital vary depending on the type of performance improvement considered.

Keywords: Supply management; Purchasing; Supplier development; Social capital; Buyer–supplier relationship

1. Introduction

Previous research has shown that Japanese firms have, at minimum, been able to gain temporary competitive advantage from resource investments in supplier relationships (Liker and Choi, 2004). However, the empirical evidence is less complete for U.S. firms. Across the various fields associated with organizational research there is growing recognition of the importance of inter-organizational relationships as a source of competitive advantage and value creation (Osborn and Hagedoorn, 1997; Powell, 1996; Smith et al., 1995). Using a social capital lens, this study was initiated to better understand the value created by U.S. firms willing to commit to long-term relationships and to develop social capital with key suppliers through supplier development.

The relationship between value creation and inter-organizational relationships has been explored using resource dependence theory (Pfeffer and Salancik, 1978), marketing channel theory (Frazier, 1983; Stern et al., 1977); transaction cost economics (Williamson, 1985), transactional value analysis (Dyer, 1997; Zajac and Olsen, 1993), resource-based theory (Tyler, 2001; Wernerfelt, 1995), social capital theory (Granovetter,

* Corresponding author. Tel.: +1 480 965 9859; fax: +1 480 965 8629.
E-mail addresses: Daniel.Krause@asu.edu (D.R. Krause), Robert_Handfield@ncsu.Edu (R.B. Handfield), Beverly_Tyler@ncsu.Edu (B.B. Tyler).
[1] Tel.: +1 919 515 4674; fax: +1 919 515 6943.
[2] Tel.: +1 919 515 1652; fax: +1 919 515 6943.

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1985; Jones et al., 1997; Tsai and Ghoshal, 1998), and information processing theory (Hult et al., 2004). A central proposition of these theories is that when organizations invest in relation-specific assets, engage in knowledge exchange, and combine resources through governance mechanisms, a supernormal profit can be derived on the part of both exchange parties. In this study we leverage social capital theory to explain the value created for buying firms committed to supplier development.

One tangible form of inter-organizational exchange that falls under the auspices of supply chain management research is a practice initiated by industrial firms called ''supplier development.'' Supplier development is any activity initiated by a buying organization[1] to improve the performance of its suppliers (Krause et al., 1998). Supplier development is an important strategy for examination because it encapsulates two of the most evident features of social capital: shared knowledge and shared asset investments. Supplier development may include goal setting, supplier evaluation, performance measurement, supplier training, and other related activities. Although this type of activity has been prevalent in Japanese and Korean firms for a number of years, it has been less evident in U.S. firms, or at least, less studied (Krause and Handfield, 1999; MacDuffie and Helper, 1997; MacDuffie, 1995). Perhaps U.S. firms have been reluctant to invest in supplier development due to a perceived lack of immediate return on investment associated with deploying the resources required to make it successful (Liker and Wu, 2000; Dyer and Nobeoka, 2000; Smock, 2001). Alternatively, perhaps U.S. firms work in different ways to improve supplier performance.

This research was undertaken to better understand the nature of supplier development efforts in the U.S. and to better understand the specific form of returns gained from investments by U.S. firms in supplier development activities. The results of this study provide two principal contributions to the extant literature. First, we argue, and subsequently demonstrate, that supplier development can conceptualized through a social capital theory lens, and that this effort provides valuable insights into the different dimensions of social capital as they pertain to relationships between industrial buying firms and their suppliers. Second, the results indicate that the importance of the dimensions of social capital varies depending on the type of buyer performance improvements being emphasized, either in the form of cost and total cost, or in terms of quality, delivery and flexibility. More broadly, the paper provides important insights into the relationship between buyer social capital commitments and buyer value creation.

The remainder of the paper briefly reviews the literature on supplier development, buyer performance goals, and the three types of social capital buying firms may establish with key suppliers to improve buyer performance: cognitive capital, structural capital, and relational capital. Next, we draw associations between supplier development practices and the different dimensions of social capital, and develop a set of hypotheses that identify relationships between the three types of social capital and buyer performance improvements. In the following sections, we describe the data, the measures, and the analysis. Finally, we present the results and discuss implications for further research.

2. Supplier development

The term ''supplier development'' was first used by Leenders (1966) to describe efforts by manufacturers to increase the number of viable suppliers and improve suppliers' performance. More specifically, supplier development has been defined as any effort by an industrial buying firm to improve the performance or capabilities of its suppliers (Krause et al., 1998). The practice of supplier development in Japan and its application globally has been well documented (Asanuma, 1989; Clark and Fujimoto, 1991; Turnbull et al., 1992). Interestingly, the practice was documented early in the 1900s in the U.S. automotive industry when Ford sought to improve suppliers' capacity and performance (Seltzer, 1928).

At about the same time supply chain management researchers began discussing supplier development, organizational theorists began arguing that complex-product industries tend to be characterized by a high degree of reciprocal interdependence on the part of intermediate component makers and final assemblers (Pfeffer and Salancik, 1978; Thompson, 1967). More recently they have also recognized that investments in relation-specific assets and knowledge sharing routines are often necessary to coordinate non-routine tasks that are reciprocally interdependent (Celly et al., 1999; Clark and Fujimoto, 1991). Examples of industries that fit these characteristics include automobiles, aircraft, electronics, heavy machinery, machine tools and robotics.

[1] The terms buying organization, buying firm and buyer are used interchangeably throughout this paper to refer to industrial firms in their role of purchasing inputs from suppliers.

Recent developments associated with the relational view of the firm are aligned with the practice of supplier development (Dyer, 1996a, 1996b, 1997; Dyer and Singh, 1998; Madhok and Tallman, 1998). According to the relational view, investments are made by buyers in the development of suppliers in order to accrue tangible benefits such as reduced cost, greater quality and flexibility, and more reliable delivery. In these situations, the buying firm may arguably be prepared to help the supplier through information sharing, technical assistance, training, and direct investment in supplier operations, in return for the benefits of improved performance and joint value creation (Zajac and Olsen, 1993). In return, the supplier firm may be expected to share information, dedicate human resources to the improvement effort, and invest in specific equipment.

From a relational perspective, buying firms must determine what knowledge and resource investments are likely to yield benefits. Moreover, appropriate controls should be established to assure that these investments are made. If the appropriate mechanisms are not in place, the supplier may not perceive the benefits associated with these investments, and may reject the initiative to modify or improve their processes (Krause et al., 1998). Furthermore, if a buyer asks a supplier to invest in relation-specific assets but is not willing to do the same, it is unlikely that the supplier will be willing to make these investments and the expected rents will not accrue.

Although the relational view of the firm is well established in the supply chain literature, there is comparatively little application of social capital theory (Nahapiet and Ghoshal, 1998; Tsai and Ghoshal, 1998). In order to extend current research and explain the value created through U.S. buyer firm supplier development initiatives, we chose to conduct a study focusing on the types of social capital investments committed by assemblers and component manufacturers in the U.S. automotive and electronics industries to the subcomponent manufacturers they have selected for supplier development. Before we develop the hypotheses, we briefly discuss the buying firm's performance goals driving these investments.

3. Buying firm performance

The fields of operations management and supply chain management have established a commonly agreed upon list of competitive priorities, which in turn have become primary performance goals for suppliers (e.g., Hayes and Wheelwright, 1984; Liker and Wu, 2000; Monczka et al., 1998). Buying firms in manufacturing industries, including automotive and electronics, have four primary competitive priorities in their end-markets: cost, quality, delivery time and reliability, and flexibility (Ward et al., 1998). Moreover, because these industries rely heavily on component suppliers, the performance outcomes of buyers are largely dependent on the performance outcomes of their suppliers. If suppliers fail to perform, the end customer is ultimately impacted.

3.1. Cost and total cost

Manufacturers in automotive and electronics pursue lower costs of their supplied inputs, so as to lower their total costs of final assembly and to provide a competitive price on their final products to end customers (MacDuffie, 1995). Improvements in the cost of products for buying firms are dependent partially on improvements by their subcomponent suppliers, for example, on reductions in rework, scrap, and downtimes. As suppliers reduce their costs, the benefits should be at least partially transferred to their industrial customers in the form of lower prices (Clark, 1989; Human and Provan, 1997; Turnbull et al., 1992). In high-tech computer markets, producers increasingly outsource production and distribution to suppliers in an effort to reduce the cost of new technology. The trade literature has recently highlighted companies' efforts to cut costs in the automotive industry by concentrating on purchases from external suppliers that provide inputs such as fuel and brake sub-systems (Dawson, 2001).

3.2. Quality

Quality has been a major focus of final assemblers since the 1980s, when a significant gap existed between Japanese and U.S. manufacturers. In the electronics industry, product quality is a given, and six sigma methodologies by companies such as Motorola have become standard practice in the industry (Monczka et al., 2000). Similarly, design-for-manufacturing methodologies in the automotive industry have resulted in quality being thought of as an order qualifier (Liker and Wu, 2000; MacDuffie and Helper, 1997). However, the quality of inputs from some suppliers is still problematic, and the quality of component parts affects customers' perceptions of quality in the final product. Some suppliers may not have adequate engineering and technical resources for quality assurance, which sometimes results in quality problems and production

delays (Human and Provan, 1997; Krause and Handfield, 1999).

3.3. Delivery

Delivery performance has two primary components: (1) reliability of delivery, which is the ability to deliver when promised, and (2) delivery speed, which is typically thought of in terms of short delivery times (Ward et al., 1998). Effective performance in both facets of delivery, may partly explain why companies like Dell have had success in reducing supply chain costs, such as minimizing the amount of buffer inventory they must hold.

3.4. Manufacturing flexibility

Firms are generally thought to respond to unpredictable environments through increased flexibility (Swamidass and Newell, 1987). Manufacturing flexibility continues to be a concern for companies as they strive to meet the changing needs of their customers. Electronics firms want to avoid holding obsolete subcomponent inventory for products when sales of those assembled products drop at the end of their life cycle. Thus, a desired outcome for buying firms is their ability to be more flexible in responding to variations in end customer demand (Jones et al., 1997). This outcome is being driven, in part, by the need for greater mass-customization of products (Clark and Fujimoto, 1991). Assemblers' flexibility can be expected to be a function of their own suppliers' quality, delivery time, reliability, and flexibility. In other words, suppliers must be able to meet changes in quantity requirements, provide timely delivery of products on short notice, and produce smaller production runs at more frequent intervals (Dyer, 1996a; Liker and Wu, 2000; Meredith, 2000; Womack et al., 1990).

3.5. The effect of commitment on buying firm performance

According to supply chain theory, performance improvements sought by buying firms are often only possible when they commit to long-term relationships with key suppliers. Experience and research suggests that when buying firms are unwilling to commit to long-term relationships and to make investments to improve suppliers' performance, suppliers may be unwilling to commit to resource investments that are relationship-specific (Krause, 1999). Suppliers see relationship-specific investments as vulnerable to opportunism when resource commitments are not forthcoming from the buying firm (Krause et al., 2000). However, when buying firms signal a commitment to a long-term relationship and indicate a willingness to make investments in key suppliers to help them improve performance, buyer performance would also be expected to improve. These arguments suggest the following hypothesis.

Hypothesis 1. There is a positive relationship between buying firms' commitments to long-term relationships with key suppliers and buying firms' performance improvements.

While buyer performance goals and the value associated with long-term commitments to key suppliers are relatively well established in the supply chain literature, the rationale for how buying firms invest resources to improve performance of key suppliers and their effect on buyer performance improvements is not well understood. Building on supplier development and social capital theories, we now develop hypotheses that posit the relationship between buyers' and key suppliers' social capital accumulation and buyer performance improvements.

4. Social capital theory

The organizational literature notes that social capital is a valuable asset that stems from access to resources made available through social relationships (Granovetter, 1992). Nahapiet and Ghoshal (1998) proposed three dimensions of social capital: structural, cognitive, and relational. They argued that the structural dimension is related to social capital resulting from the structural configuration, diversity, centrality and boundary-spanning roles of network participants. The cognitive dimension of social capital refers to the resources that provide parties with shared representations, interpretations, and systems of meaning. They also suggested that shared meanings, such as shared values and goals, develop through an ongoing and self-reinforcing process of participation in sense making processes as the parties construct a shared understanding (Weick, 1995). Finally, Nahapiet and Ghoshal suggested that the relational dimension refers to personal relationships that develop through a history of interactions, i.e., the extent to which trust, obligation and reciprocity exist between the parties.

The impact of social capital on performance has been studied at multiple levels using different performance

measures. Some researchers have focused on relational ties (structural capital) (e.g., Burt, 1992, 2000; Walker et al., 1997), while others have considered the strength of those ties (relational capital) (e.g., Granovetter, 1973, 1985; Hansen, 1999). Some researchers have considered both. For example, Moran (2005) examined the impact of managers' structural and relational capital on their performance. He found that structural capital played a stronger role in explaining execution-oriented managerial tasks while relational capital played a stronger role in explaining innovation-oriented tasks, and encouraged future research to consider the effects of both on a variety of performance measures. However, empirical social capital research has seldom considered the impact of cognitive capital, in terms of shared values and goals, on firm performance. We will draw from the social capital literature to hypothesize the relationships between dimensions of social capital and buyer performance improvement.

Organizational scholars posit that alliance partners' investments in inter-firm knowledge-sharing routines result in value creation (Dyer and Singh, 1998; Grant, 1996; Tyler, 2001). Regarding supplier development, such routines are fundamental to any supplier improvement effort initiated by a buying firm. Knowledge shared by buying firms includes both the transfer of factual knowledge, such as sharing of production schedules (Kogut and Zander, 1992), and the transfer of tacit, ''sticky'' knowledge, such as technology roadmaps and shared values (Szulanski, 1996). Inkpen and Tsang (2005) considered conditions that facilitate knowledge transfer in strategic alliances. They argued that knowledge transfer was enhanced when there were long time horizons, high behavioral transparency and multiple knowledge connections between partners, a noncompetitive approach to knowledge transfer, goal clarity, repeated exchanges, and frequent partner interactions. In this paper, we consider many similar factors in a supply chain setting.

4.1. Cognitive capital

Social capital theory suggests that cognitive capital consists of the resources providing the parties with shared representations, interpretations, and systems of meaning (Nahapiet and Ghoshal, 1998). Tsai and Ghoshal (1998) argued that within a firm cognitive capital is embodied in a shared vision, i.e., collective goals and aspirations of the parties, and is present when partners have similar perceptions of common goals and how they should interact. Inkpen and Tsang (2005) suggested that shared goals and culture are the primary dimensions of cognitive capital. They argued that goals are shared when members of a network share a common understanding and approach to achievement of network tasks and outcomes. When goals and values are shared by buyers and their key suppliers, continued interactions should result in an ongoing and self-reinforcing process of participation in sense making as the parties interact and socially construct a shared understanding (Weick, 1995). In the context of supplier development, this self-reinforcing process of cooperative cognitive sense making can be expected to improve buyer performance. If goals are shared, buyers and suppliers can be expected to have a shared understanding of what constitutes improvement and how to accomplish it. This should lead to greater improvement in cost, quality, delivery and flexibility.

If goals and values are incongruent, interactions between the two parties can be expected to lead to misinterpretation of events and conflict (Inkpen and Tsang, 2005; Schnake and Cochran, 1985). As misinterpretation and conflict intensifies, both parties can be expected to become dissatisfied, and to limit information sharing, resulting in negative effects on productivity and performance. Linking this back to supply chain research, Zaheer et al. (1998) found a negative relationship between the level of buyer–supplier conflict and supplier performance in the electrical equipment manufacturing industry. Handfield and Nichols (1999) argued that diverse views of quality and timeliness should be resolved so that joint efforts of buyers and suppliers can focus on necessary activities and that shared meaning becomes a critical mechanism to ensure coordination. Hult et al. (2004) found that in supply chains, shared meaning is related to both objective and subjective measures of cycle-time reduction. These arguments suggest that when buyers and their key suppliers have similar goals and values for their relationship, cognitive capital will positively affect performance.

Hypothesis 2. There is a positive relationship between buying firms' perceptions of shared values and goals with key suppliers and buyers' performance improvements.

4.2. Structural capital

Bessant et al. (2003) concluded that the collectivity and shared purpose associated with social capital help to establish 'appropriate practices' between firms. Research has suggested that practices may range from general information sharing of codified information to the sharing of tacit knowledge. Organization theory and

supply chain management research have recognized the central role of information sharing to the acquisition of capabilities through inter-firm ties, in general (Ahuja, 2000; Gulati, 1999; Stuart, 1998), and information sharing with key suppliers, more specifically (Uzzi, 1997; Dyer and Nobeoka, 2000). Information sharing in this literature has typically been defined as "the degree to which each party discloses information that may facilitate the other party's activities" (Heide and Miner, 1992: 275) and includes what we describe as information sharing, supplier evaluation and more "direct involvement" supplier development activities such as regular visit to suppliers' facilities and supplier training (Krause et al., 2000; McEvily and Marcus, 2005; Uzzi, 1997).

In collaborative buyer–supplier relationships, attitudes toward learning are noncompetitive, which can be expected to lead to greater symmetric learning than in other forms of alliances (Inkpen and Tsang, 2005). Furthermore, in a supplier development context we can expect information exchanges between key suppliers and buyers to be more detailed, intricate, and proprietary than in arm's-length relationships (Uzzi, 1996). Supplier development activities, especially those dubbed "direct involvement" activities, are much more complex than short-term contracting and as such buyer performance should be improved by matching diverse communication requirements with different methods of information sharing (Krause et al., 2000; Brass et al., 2004). Hansen (1999) notes that strong ties provide a better conduit for the transfer and exchange of complex issues and ideas. For example, a buyer and supplier struggling to arrive at shared meanings may rely more on rich media, such as site visits or co-location of employees in order to facilitate resolution of various perceptions and to effectively transmit emotions and subtleties (Daft and Lengel, 1986; Hult et al., 2004; Nonaka, 1994).

Thus, different supplier development efforts may be associated with different means of information sharing. When information is codified, knowledge related to tangible resources and their meaning is generally agreed upon and understood, and information can be shared using communication technology (Moran, 2005). Examples of information that is relatively easily interpreted and that can be easily transferred through computing and communication technologies, include uncertainty in market demand, raw materials supply, tariffs, and supplier performance data (Lin et al., 2002; Reed and Walsh, 2002). Moreover, supplier evaluations and audits, providing performance feedback to suppliers, and supplier certification, should provide both the buyer and supplier with important information exchange that should ultimately help buyers improve their own performance.

In addition to the above, buying firms committed to "direct involvement" supplier development activities provide more personal, face-to-face interactions with their suppliers and thus should be more successful in transferring tacit knowledge and accrue performance improvements as a result of their investments because the ambiguity of tacit knowledge requires thicker information exchange (Lawson et al., 2006; Moran, 2005). Thus, buying firms that engage in "direct involvement" supplier development to transfer tacit knowledge may include such activities as regular site visits by buyer personnel, training of the supplier's employees, and a dedicated supplier development team (Krause et al., 2000).

The extant research has suggested that future research should consider how supplier development activities vary across different performance goals (Krause et al., 2000). The knowledge sharing activities necessary for lowering the buying firm's costs, are arguably not the same as might be required to transfer tacit knowledge to improve quality, delivery, and flexibility performance—the latter three being more related to process and product innovation (McEvily and Marcus, 2005; Moran, 2005). Sharing of information such as the results of supplier evaluation could be expected to provide the social capital accumulation most relevant to cost performance improvements. Because more intense supplier development activities require more human capital commitment than is required for sharing more easily codified information, the costs associated with them could easily be greater than the value they might provide the buyer (Daft et al., 1993). In contrast, improvements in quality, delivery, and flexibility are more likely to require buyers' commitment to more intensive supplier development efforts. These improvement goals may require more personal interaction, discussion and common experiences, which allow for clarification of issues and the establishment of shared understandings of ambiguous information (Daft and Lengel, 1984, 1986; Thomas and Trevino, 1993; Hansen, 1999; Brass et al., 2004).

To summarize, structural capital investments and accumulations can be expected to improve buyer performance. However, the effects of various types of structural capital can be expected to differ according to the type of performance improvements sought. The theory presented suggests that basic information sharing

and supplier evaluation should be more positively related to improvements in buyer costs than other supplier development efforts where tacit knowledge exchange is necessary. Furthermore, supplier development initiatives that focus on more personal forms of communication that entail the transfer of tacit knowledge will be more positively related to buyer improvements in quality, delivery speed and reliability, and flexibility than simple information sharing or supplier evaluation. Thus, we propose the following hypotheses.

Hypothesis 3a. There are stronger positive relationships between buyers' efforts to share information and evaluate suppliers to achieve buyers' cost performance improvements, than between buyers' ''direct involvement'' supplier development activities and cost improvements.

Hypothesis 3b. There is a stronger positive relationship between buyers' ''direct involvement'' supplier development activities with key suppliers to achieve buyers' performance improvements in quality, delivery, and flexibility—than between buyers' efforts to share information and evaluate suppliers, and these performance improvements.

4.3. Relational capital

The extant relational capital literature has argued that as the level of interaction between alliance partners increases, organizational routines are established (Nelson and Winter, 1982), and the investment in co-specialized assets and level of bilateral dependence also increases (Teece, 1986). Co-specialization is believed to be the result of investments in skills and routines adapted to the exchange and the development of social relationships among partners (Levinthal and Fichman, 1988). Experience with a partner is said to raise collaborative expectations and stimulate learning and readjustment cycles as the relationship evolves (Doz, 1996). For example, Reuer et al. (2002) argued that partner-specific experience facilitates ex post adjustments in alliance monitoring mechanisms, which suggests that prior ties facilitate adjustment as a consequence of familiarity and the development of inter-organizational routines.

Previous researchers have argued that trust tends to increase with the length of the relationship between buyers and suppliers (Helper, 1991; Sako and Helper, 1998). Previous research has found that repeated partner-specific ties have a stronger effect on knowledge accumulation than does repeated technology-specific or repeated general experience ties, and that non-equity based alliances are more tightly coupled to the number of previous ties between partners than equity based alliances (Gulati, 1995a; Reuer et al., 2002).

Furthermore, a prior history of cooperation between firms has been found to reduce their expectations of opportunism (Parkhe, 1993) and decrease their perceptions of exchange hazards (Deeds and Hill, 1998). Building on this stream of research, Ring and Van de Ven (1994) and Gulati (1995a) noted that past transactions may alter the calculus for further transactions since a history of interaction decreases the expected cost of dealing with suppliers. These arguments have been extended to suggest that relational norms established through prior exchanges substitute for complex, explicit contracts or vertical integration (Dyer and Singh, 1998; Gulati, 1995b). Through repeated interactions the parties appear to develop trust in one another such that they may no longer need to rely on formal contacts to ensure performance (Zaheer and Venkatraman, 1995).

Hoetker (2005) investigated how interactions improve communication between buyers and suppliers. He argued that relationship-specific communication and coordination routines develop over time (Mitchell and Singh, 1996), partners with first-hand knowledge of each other's capabilities are more effective in assigning tasks to the most capable party (Fichman and Levinthal, 1991), and that through multiple interactions buyers and suppliers develop a common language for discussing technical and design issues (Buckley and Casson, 1976). Hoetker (2005) argued that first hand knowledge of a partner's past behavior provides information and that due to past interactions exchange partners are less likely to act opportunistically for social, psychological, and economic reasons (Crocker and Reynolds, 1993; Granovetter, 1995). Furthermore, he suggested that trust develops between individuals as they engage in repeated transactions and it becomes institutionalized, leading to trust between organizations that endures despite changes in the individuals involved (Zaheer et al., 1998).

Research on buyer–supplier relationships has also found that that cooperation increases with a higher frequency of contact in the relationship (Heide and Miner, 1992), and that trust between buyers and suppliers increases the longer they work together (Helper, 1991). Furthermore, Stuart et al. (1998) suggested that cost reductions and the development of problem solving capabilities are the main benefits

accrued. Thus, in the context of supplier development, it can be argued that relational capital, as represented by the years of the buyer–supplier relationship and the dependency of the buyer and the supplier to the relationship, can be expected to be positively related to buyer performance improvement.

Hypothesis 4a. There is a positive relationship between the length of buying firms' relationships with key suppliers and buyers' performance improvements.

Hypothesis 4b. There is a positive relationship between buying firms' perceptions of buyer and supplier dependency on the relationship and buyers' performance improvements.

5. Methods

We collected data from purchasing executives employed by firms in the automotive and electronics industries with prior experience in improving a key supplier's performance. We also collected data from a subset of these key suppliers. Not all of the firms represented were direct producers of automobiles or electronics; as such, they may be listed under different industrial codes. However, their final customers were automobile assemblers or electronics assemblers, and thus they are part of an automobile or electronics supply chain.

The Institute for Supply Management (ISM) continues to use SIC codes, and provided us with a list of their title 1 members employed by firms in the electronics industry, SIC code 36. Title 1 ISM members are purchasing executives with titles such as director and manager. Subsequently, we drew a random sample of 750 names from that list. A sample of executives working for firms in the automotive industry was also targeted using a four-digit SIC code within the U.S. automotive industry—Motor Vehicle Parts & Accessories (SIC 3714). A comprehensive database of 2945 U.S. manufacturing facilities with this SIC code was obtained from Elm International, in East Lansing, MI. A random sample of 750 names was drawn the list, which included contact information for purchasing executives.

A buyer questionnaire was mailed to each of the 1500 purchasing executives in the electronics and automotive sub-samples. The questionnaire asked respondents to report on their firm's relationship with one supplier that they had worked with to improve performance. At the end of the questionnaire respondents were asked to share the contact information of a key contact at the supplier firm. This request resulted in contact information for 124 supplier firms from the 392 responses received from the buying firms. Nineteen surveys were set aside from the analysis because of incomplete information; thus the effective response rate was approximately 25%. To encourage responses, a variation of Dillman's tailored design method was used (Dillman, 2000). An initial mailing of surveys was followed 10 days later by reminder postcards. Twenty-nine days after the initial mailing, a second wave of surveys was sent to non-respondents.

Although there is no generally accepted minimum percentage for response rates, non-response bias is always a concern. One method for testing non-response bias is to test for significant differences between the responses of early and late waves of returned surveys (Lambert and Harrington, 1990). This approach is based on the assumption that late responders are somewhat representative of the opinions of non-respondents. For the present study, twenty of the survey items used for the analysis were randomly selected from the buyer survey, two groups of seventy surveys were chosen from the first and last waves of surveys received, and *t*-tests were performed on the responses of the two groups. The *t*-tests yielded no statistically significant differences among the twenty survey items tested. Although these results do not rule out non-response bias, they suggest that non-response may not be a problem to the extent that late responders represent the opinions of non-respondents.

5.1. Supplier data

A survey was mailed to the supplier contact with a letter describing the purpose of the study and identifying the buyer respondent who had provided their contact information. They were asked to complete a questionnaire that was similar to the buyer's, and were assured of strict confidentiality. Seventy-five useable supplier questionnaires were returned; thus the effective response rate for the supplier sample was approximately sixty percent.

This set of 75 supplier surveys provided a dyadic data set for a subset of the buying firms. Because the dyadic data set was small, and the questions asked of the supplier were a subset of the questions asked of the buying firm respondent, the use of this data was limited for the present paper. However, correlations were run on a few items that were common across the two surveys. For example, we asked the buyer and supplier respondents about their level of agreement with the

following two statements: (1) We expect to be working with this supplier [customer] for the foreseeable future, and (2) our relationship with this supplier [customer] is long-term in nature. The correlation between these two combined items across the buyer and supplier dyads was 0.35, and significant at $p < 0.01$ ($n = 74$). This result provides some indication that the two parties shared similar perceptions of the relationship.

5.2. Dependent variables

Two distinct sets of dependent variables were identified. The notion of competitive priorities in operations, purchasing and supply chain management provides four primary factors: cost, quality, delivery and flexibility, with some researchers adding innovation as a fifth factor (Krause et al., 2001; Ward et al., 1990, 1998). A set of single-item scales asked buying company respondents to indicate the effect of supplier development on the performance of the buying firm's own products, in terms of cost, total cost, product quality, delivery times, delivery reliability, flexibility and other factors. Each of these items was measured on a seven-point Likert scale, where 1 = strongly agree, 4 = neutral and 7 = strongly disagree. These items were evaluated using an exploratory factor analysis, as shown in Appendix 1. The cost and total cost items clearly loaded together forming one factor. Similarly, the quality, delivery and flexibility items also loaded together as one factor.

5.3. Independent variables

The independent variables incorporated into the analysis included buyer commitment, shared values, information sharing, supplier evaluation, ''direct involvement'' supplier development activities, length of relationship, supplier dependence, and buyer dependence. Appendix 2 provides the survey items. All scale items were measured using a seven-point Likert scale where 1 = strongly agree, 4 = neutral, 7 = strongly disagree, except as noted.

5.3.1. Buyer commitment

Relationship commitment is a common measure used in examining dyadic supply chain relationships. Performance improvements sought by buying firms are often only possible when they commit to a long-term relationship with their key suppliers (Krause, 1999). The factor was measured using two questions which tapped into the concept of relationship continuity ($\alpha = 0.84$).

5.3.2. Shared values

Three scale items comprise the scale for shared values ($\alpha = 0.84$). These three items tap well into the idea that goals and values may be shared by buyers and their key suppliers (Weick, 1995).

5.3.3. Information sharing

Effective information sharing is believed to be an essential antecedent to the buying firm's involvement in supplier development (Krause, 1999). Effective inter-organizational communication may be characterized as varying along some or all of the following dimensions: frequency, degree of formality, level of willingness to share proprietary information, and timeliness (Heide and Miner, 1992). In this study, buying firm respondents were asked to specify the extent of their willingness to share information with the supplier. Information sharing was measured with three scale items ($\alpha = 0.72$).

5.3.4. Supplier evaluation

The items measuring supplier evaluation include formal evaluation, feedback of the evaluation results, and the use of supplier certification, the latter being a form of evaluation with a focus on processes. The first two of these items is similar in wording to those used by Krause et al. (2000) to measure the factor they called supplier assessment ($\alpha = 0.77$).

5.3.5. Supplier development

Supplier development activities vary in terms of the degree of involvement of the buying firm with the supplier. Krause et al. (2000) differentiated supplier development activities that were internalized by the buying firm and thus involved direct involvement of the buying firm's personnel, from other supplier development ''hands-off'' activities that did not involve significant personnel time investments. We have taken a similar ''direct involvement'' approach in the present study. Thus, the measures used for supplier development focus on direct involvement activities, specifically the allocation of personnel to improve the supplier's skill base, regular visits to the supplier by the buyer's engineers, and dedicated supplier development teams ($\alpha = 0.75$; seven-point Likert scales with 1 = extensively, 4 = somewhat, and 7 = very little).

5.3.6. Length of relationship

The length of relationship variable was a single, open-ended question which asked respondents: ''approximately how long has your company been purchasing from this supplier?'' The question specifically asked for the length of the relationship in years.

5.3.7. Buyer dependence

Buyer dependence was investigated using four questions that examined how unproblematic the supplier was to replace, perceptions of how many suppliers were available, and whether finding a new supplier might require a redesign of the purchased part ($\alpha = 0.81$).

5.3.8. Supplier dependence

Supplier dependence was measured from the buying firm's perspective, asking the respondents how dependent they perceived the supplier to be on their firm's business. In our experience of gathering case data on supplier development, we have found that buying firm representatives typically know how dependent a supplier is on them for its business. Many firms have explicit guidelines regarding numerical limits on how much of a supplier's output to purchase. These policies are typically in place so as to limit suppliers' dependence. Thus, these items asked how easy it might be for the supplier to look elsewhere for business if they stopped purchasing from them ($\alpha = 0.74$).

5.4. Control variables

We controlled for industry with two environmental variables. The respondent sample included firms that were part of either the electronics or automotive industries. Thus, the sample was not very heterogeneous with respect to the destination of their products. Despite this relative homogeneity, we used perceptual measures that focused on the rate of obsolescence and the relative change of technology in the industry. Because supplier development efforts use firms' resources, we felt that larger firms might be likely to engage in these efforts and thus controlled for size by using annual sales as a surrogate.

6. Results

The industries represented in the buying firm sample included automotive ($n = 173$), electrical equipment and electronics ($n = 70$), industrial machinery ($n = 59$), miscellaneous manufacturing ($n = 61$), and not reported ($n = 11$). Supplier respondents were a diverse group with industrial machinery ($n = 34$), metal products ($n = 13$), transportation equipment ($n = 4$), electronics ($n = 7$), other manufacturing ($n = 11$), and non-manufacturing ($n = 6$). The buying firm respondents were comprised of executives with titles including director of purchasing, purchasing manager, materials manager, senior buyer, commodity manager, and similar titles, as shown in Table 1. The respondent firms' gross annual sales are reported in Table 2—the sample is heavily populated by larger firms.

Table 1
Titles of buying firm respondents

Titles	Frequency	Percentage
Purchasing manager	122	33.1
Materials manager	42	11.4
Purchasing agent	41	11.1
Director of purchasing/sourcing	31	8.4
Senior buyer	25	6.8
Buyer	13	3.5
Vice-president	11	3.0
Commodity manager	13	3.5
Director of materials management	10	2.7
Miscellaneous titles	61	16.5
	369[a]	100.0[b]

[a] Frequency missing = 5.
[b] Of those respondents that reported.

Descriptive statistics and correlations of the variables and factors are provided in Table 3. The average length of the relationship reported on by the buying firm respondents was approximately 12.5 years. The remaining variables in Table 3 are summated variables. Additional information on the variables is provided in Appendices 1 and 2, which provide the specific wording of the scale items, the results of the exploratory factor analysis, and Cronbach alpha for each set of scale items. The exploratory factor analysis resulted in clean factor loadings for the various factors. A small number of survey items were thrown out because of cross-loading across factors.

6.1. Dependent variables: cost and total cost

Table 4 provides the results of the regressions for the main effects of buyer commitment, shared values,

Table 2
Respondents' sales

Companies' annual gross sales dollars	Frequency	Percentage
Less than $ 1 million	1	0.3
$ 1–5 million	15	4.3
$ 5–10 million	16	4.5
$ 10–50 million	107	30.4
$ 50–100 million	62	17.6
$ 100–500 million	89	25.3
$ 500–1 billion	16	4.5
Over $ 1 billion	46	13.1
	352[a]	100.0[b]

[a] Frequency missing = 22.
[b] Of those respondents that reported Sales.

Table 3
Correlations and descriptive statistics

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Perform: cost/total cost	5.44	2.54	1.00											
2. Perform: quality, delivery, manufacturing flexibility	10.45	4.52	0.52*	1.00										
3. Environment: dynamism	7.50	2.73	−0.04	0.05	1.00									
4. Annual sales	5.20	1.57	−0.08	−0.05	0.15*	1.00								
5. Buyer commitment	3.88	2.03	0.31*	0.37*	0.04	−0.06	1.00							
6. Shared values	7.30	3.29	0.37*	0.50*	0.10*	0.06	0.42*	1.00						
7. Information sharing	6.32	2.76	0.15*	0.24*	0.03	−0.05	0.33*	0.41*	1.00					
8. Supplier evaluation	8.52	4.76	0.13*	0.22*	−0.02	−0.31*	0.16*	0.14*	0.16*	1.00				
9. Supplier development	14.51	4.87	0.09	0.21*	−0.15*	−0.39*	0.07	0.10	0.16*	0.37*	1.00			
10. Length of relationship	12.42 years	9.72	−0.01	−0.08	−0.04	0.17*	−0.21*	−0.16*	−0.06	−0.04	0.00	1.00		
11. Buyer dependence	15.65	6.64	0.07	−0.03	0.03	0.14*	−0.09	0.01	−0.03	−0.04	−0.16	0.07	1.00	
12. Supplier dependence	18.11	5.45	−0.09	−0.02	0.04	0.17*	−0.04	0.03	0.01	−0.00	−0.12	−0.08	0.21*	1.00

$N \sim 370$.
* 0.05 level of significance.

information sharing, supplier evaluation, supplier development, relationship length, buyer dependence and supplier dependence, on buyer performance as measured in terms of cost and total cost. Model 1 is the baseline model—the model was not significant and none of the control variables was significant. Model 2 evaluated the impact of buyer commitment. The results indicate that although the control variables were not significant, buying firm commitment was highly significant ($p < 0.01$). This result indicates support for Hypothesis 1.

Model 3, in Table 4, examined the impact of shared values, information sharing, supplier evaluation, supplier development, length of relationship, buyer dependence and supplier dependence, in addition to the control variables and buyer commitment. The control variable of environmental dynamism was significant ($p < 0.10$), as was buyer commitment ($p < 0.01$) which provides additional support for Hypothesis 1. The results of Model 3 indicate that shared values (Hypothesis 2; $p < 0.01$), buyer dependence (Hypothesis 4b; $p < 0.01$), and supplier dependence (Hypothesis 4b; $p < 0.10$) were all significant which provides support for Hypotheses 2 and 4b. The variables of information sharing, supplier evaluation, supplier development (Hypothesis 3a), and length of the relationship (Hypothesis 4a) were not significant.

In summary, the analysis found support for Hypotheses 1, 2 and 4b but not Hypothesis 3a or 4a, when viewing buyer performance as it pertains to cost and total cost.

6.2. Dependent variables: quality, delivery and manufacturing flexibility

Table 5 reports the main effects of buyer commitment, shared values, information sharing, supplier evaluation, supplier development, length of relationship, buyer dependence, and supplier dependence, on the dependent factor of buyer performance, defined in terms of quality, delivery and manufacturing flexibility. Model 1, including only the control variables, was not significant; thus there were no significant effects for environmental dynamism, annual sales, or annual sales squared.

Model 2 examined the effects of the control variables and buyer commitment. The overall model was significant, as was the buyer commitment variable ($p < 0.01$). This result provides additional support for Hypothesis 1.

Table 4
Regression analysis for performance: cost, total cost

Independent variables	Cost total cost		
	Model 1	Model 2	Model 3
Constant	7.322 (1.337)	5.752 (1.286)	4.531 (1.487)
Environment: dynamism	−0.030 (0.050)	−0.045 (0.047)	−0.083* (0.047)
Annual sales	−0.542 (0.488)	−0.520 (0.460)	−0.516 (0.452)
Annual sales × annual sales	0.038 (0.045)	0.039 (0.042)	0.033 (0.041)
Buyer commitment		0.390*** (0.063)	0.274*** (0.071)
Shared values			0.248*** (0.045)
Information sharing			−0.073 (0.051)
Supplier evaluation			0.026 (0.029)
Supplier development			0.010 (0.030)
Length of the relationship in years			0.022 (0.014)
Buyer dependence			0.056*** (0.020)
Supplier dependence			−0.044* (0.024)
Adjusted R^2	0.00	0.10	0.20
F	1.19 n.s.	10.70***	8.47***

* $p < 0.10$.
*** $p < 0.01$.

The variables that measure the various effects of social capital were included in Model 3. This model was significant overall, with an adjusted R^2 of 0.30. The control variable of annual sales was negative and moderately statistically significant ($p < 0.10$). Additional significant variables included buyer commitment ($p < 0.01$), shared values ($p < 0.01$), and supplier development ($p < 0.01$)—these results indicate support for Hypotheses 1, 2 and 3b. The remaining variables of information sharing, supplier evaluation, length of relationship, buyer dependence and supplier dependence were not significant, indicating no support for Hypothesis 4a or 4b.

To summarize the results, overall, from the analyses represented in Tables 4 and 5, support was found for Hypotheses 1, 2, 3b and mixed support for Hypothesis 4b. No support was found for Hypothesis 3a or 4a.

Table 5
Regression analysis for performance: quality, delivery, manufacturing flexibility

Independent variables	Quality delivery manufacturing flexibility		
	Model 1	Model 2	Model 3
Constant	13.138 (2.364)	10.065 (2.208)	4.789 (2.471)
Environment: dynamism	0.114 (0.089)	0.088 (0.082)	0.056 (0.079)
Annual sales	−1.229 (0.863)	−1.230 (0.790)	−1.280* (0.751)
Annual sales × annual sales	0.095 (0.079)	0.100 (0.073)	0.113 (0.069)
Buyer commitment		0.784*** (0.108)	0.495*** (0.119)
Shared values			0.549*** (0.075)
Information sharing			−0.075 (0.087)
Supplier evaluation			0.057 (0.049)
Supplier development			0.146*** (0.050)
Length of the relationship in years			0.039 (0.023)
Buyer dependence			0.002 (0.034)
Supplier dependence			−0.004 (0.040)
Adjusted R^2	0.00	0.14	0.30
F	1.62 n.s.	14.91***	13.88***

* $p < 0.10$.
*** $p < 0.01$.

7. Discussion

The present research indicates that social capital is a promising theory for supply chain research, with its focus on creating and sharing knowledge across organizations (Nahapiet and Ghoshal, 1998). Hult et al. (2004) argued that future research would benefit from using a variety of organizations and social capital outcomes such as quality, cost and flexibility. The results of this research indicate support for the application of social capital theory to buyer–supplier relationships in the context of supplier development. The present work also reinforces the notion that the different dimensions of social capital, in terms of structural embeddedness, relational embeddedness, and the cognitive dimension are useful explanatory constructs that deserve more investigation in a supply chain context.

To restate our findings, we examined buyer–supplier relationships through a social capital lens, with a specific focus on buyer performance achievements gained through supplier development. Our findings indicate that commitment between the two firms is an important complementary condition to establishing performance goals, and provides value to buying firms that seek social capital accumulation with suppliers. Further, our findings suggest that the different dimensions of social capital have unique effects depending on performance goals: cost and total cost, versus quality, delivery, and flexibility.

Specifically, cognitive capital in the form of shared values, and relational capital in the form of buyer and supplier dependence, were important in explaining buyer performance achievements in cost and total cost. In contrast, in explaining buying firm performance in terms of quality, delivery and flexibility, cognitive capital in the form of shared values, and structural capital in the form of supplier development activities were more important. Common explanatory factors for both dimensions of performance included commitment to the relationship and cognitive capital.

Performance outcomes in quality, delivery and flexibility appear to depend more on ''direct involvement'' supplier development activities than cost performance outcomes. We measured direct involvement supplier development in terms of allocating buyer personnel to improve the supplier's technical skill base, a dedicated supplier development team, and regular visits to the supplier by the buying firm's engineering personnel. The type of interaction implied in these items would indicate an environment that facilitates the transfer of tacit knowledge between the two firms and facilitates learning.

Improvements in both dimensions of performance are likely to require shared values and goals, and these could also be communicated more accurately in the face-to-face interactions that take place over time with dedicated teams visiting the supplier's facilities—however, only the quality, delivery and flexibility performance dimension was significant for supplier development activities. Cost and total cost concerns may be more aptly addressed at the negotiation table during periodic contractual negotiations, than quality, delivery and flexibility concerns, or at least be accomplished without the in-depth communication that takes place during supplier development visits.

We did not find support for the effects of information sharing and supplier evaluation on either type of performance. Clearly, information sharing is incorporated into any relationship, and is an important part of the supplier development factor as we measured it. Thus, as argued earlier, the information sharing that takes place in ''direct involvement'' supplier development may be more conducive to sharing tacit information, and the results of the analysis provide support for this notion. Hult et al. (2004) encouraged future research to further articulate the influence of information within the social capital context where shared meanings may mediate effects of information distribution activities. Subsequent research efforts will hopefully revisit information sharing, both the interpersonal information investigated in this paper, and impersonal types such as information technology.

Nahapiet and Ghoshal (1998) noted the importance of interdependence on the development of social capital, but our findings indicate that interdependence was only significant for the cost performance factor. Our measure of relationship length was not significant for either type of performance improvement. Thus, future research could also bring in trust and attempt to distinguish trust, measurement-wise, from the notion of shared values and goals.

8. Conclusion

The significant increase in outsourcing over the past two decades has fueled researchers' interest in the benefits of buyer–supplier relationships. As cooperation and collaboration between buyers and suppliers has increased, the performance of these relationships, and the fact that there are socially embedded dimensions should be of interest to researchers. However, knowledge is limited in terms of the different dimensions of social capital and their unique contributions to the various dimensions of performance.

The literature in strategy and organizational theory has examined social capital for some time, but the applications in supply chain research are relatively limited. Inkpen and Tsang (2005) argued that we need to examine in detail the characteristics of different network types. This study is in response, in part, to their call. We have taken a special type of strategic alliance – supplier development initiatives by buying firms – and sought to study dimensions of cognitive, structural and relational capital. We found support for their suggestion that different types of knowledge types have different effects on organizational processes and that tacit knowledge requires more intimate personal interaction than more codified and easily understood knowledge.

Thus, the present study provides some initial understanding of industrial buyer–supplier relationships and how their social capital dimensions relate to buying firm performance. We believe more research is needed. Specifically, future efforts could focus on existing measures of the three dimensions of social capital, and on additional measures of buying firm performance such as innovation. Compared to the transaction cost economics perspective that prevails in the extant supply chain literature, social capital offers an opportunity for increased understanding of the complexities of supply chain relationships. We hope other researchers will further investigate the social dimensions of these relationships.

Appendix A. Exploratory factor analysis of dependent variables only

Survey Item	Quality Delivery Manufacturing Flexibility	Cost Total Cost
Our supplier improvement effort with this supplier has helped . . .		
. . . lower the total cost of our products.	.004	.935
. . . reduce our product cost	.059	.895
. . . improve our product quality	.646	.156
. . . shorten the delivery times of our products	.876	.047
. . . increase the reliability of our product delivery times.	.962	-.105
. . . improve our manufacturing flexibility	.785	.074
Cronbach Coefficient Alpha	.83	.84

Appendix B. Exploratory factor analysis results—independent factors

Survey Items	Buyer Depend	Shared Values	Supplier Depend	Perform Evaluation	Supplier Development	Info Sharing	Buyer Commitment
We expect to be working with this supplier for the foreseeable future	-.028	-.064	.007	-.011	-.049	.052	.941
Our relationship with this supplier is long-term in nature	-.002	.074	-.007	.010	.011	-.024	.881
It is expected that the parties will provide proprietary information if it can help the other party	-.068	-.002	.087	-.053	.047	.836	-.144
Exchange of information in this relationship takes place frequently	.129	.180	-.032	.063	.086	.613	.175
It is expected that we keep each other informed about events or changes that may affect the other party	-.092	.099	-.002	.023	-.054	.676	.133
Allocation of your personnel to improve supplier's technical skill base.	.056	-.035	-.078	.042	.828	.030	-.057
Regular visits by your engineering personnel to supplier's facilities	-.005	-.118	-.027	-.104	.845	.112	.030
Dedicated supplier development team.	-.081	.142	.090	.148	.731	-.095	-.024
Assessment of supplier's performance through *formal* evaluation, using established guidelines and procedures	-.029	.040	.025	.914	-.018	-.010	-.045
Provide supplier with feedback about the results of its evaluation	.040	-.121	-.066	.865	-.040	.218	-.065
Use of a supplier certification program to certify supplier's quality, thus making incoming inspection unnecessary.	-.014	.051	.048	.693	.121	-.215	.144
Both firms share the same business values	-.012	.896	-.012	-.011	-.038	.032	-.032
The parties often agree on what is in the best interest of the relationship	-.006	.859	-.037	-.026	-.026	.128	-.069
This supplier shares our goals for this business	.057	.807	.018	.005	.019	-.004	.097
If we decided to stop purchasing from this supplier, we could easily replace their volume with purchases from other suppliers.	.808	.021	.020	.011	-.009	-.063	-.050
There are many competitive suppliers for this component	.812	.010	.017	-.063	.079	-.014	.067
Our production system can be easily adapted to use components from a new supplier	.822	-.103	-.011	.032	-.103	.088	-.013
Dealing with a new supplier would only require a limited redesign and development effort on our part.	.712	.116	.009	.015	.010	-.087	-.041
If we stopped buying from this supplier, they could easily replace our volume with sales to some other buyer	.016	.043	.781	-.059	.091	-.003	.004
It would be relatively easy for this supplier to find another buyer for these components	-.002	.021	.828	-.023	-.023	-.022	-.000
Finding new buyers for these components would not have a negative impact on the price this supplier can charge	.071	-.159	.681	.033	.009	.140	.045
If the relationship with our company was terminated, it would not hurt this supplier's operations	-.040	.037	.688	.063	-.117	-.018	-.047
Cronbach Coefficient Alpha	.81	.84	.74	.77	.75	.72	.84

References

Ahuja, G., 2000. Collaboration networks, structural holes, and innovation: a longitudinal study. Administrative Science Quarterly 45, 425–455.

Asanuma, B., 1989. Manufacturer–supplier relationships in Japan and the concept of relation-specific skill. Journal of the Japanese and International Economics 3, 1–30.

Bessant, J., Kaplinsky, R., Lamming, R., 2003. Putting supply chain learning into practice. International Journal of Operations & Production Management 23 (2), 167–184.

Brass, D.J., Galaskiewicz, J., Greve, H.R., Tsai, W., 2004. Taking stock of networks and organizations: a multilevel perspective. Academy of Management Journal 47 (6), 795–817.

Buckley, P., Casson, M., 1976. The Future of Multinational Enterprise. Macmillan, London.

Burt, R.S., 1992. Structural Holes: The Social Structure of Competition. Harvard University Press, Cambridge, MA.

Burt, R.S., 2000. The network structure of social capital. In: Staw, B.M., Sutton, R.I. (Eds.), Research in Organizational Behavior, 22. JAI Press, Greenwich, CT, pp. 345–431.

Celly, K., Spekman, R., Kamauff, J., 1999. Technological uncertainty, buyer performance and supplier assurances: an examination of Pacific rim purchasing arrangements. Journal of International Business Studies 30 (2), 297–316.

Clark, K.B., 1989. Project scope and project performance: the effect of parts strategy and supplier involvement on product development. Management Science 35, 1247–1263.

Clark, K.B., Fujimoto, T., 1991. Product Development Performance. Harvard Business School Press, Boston MA.

Crocker, K.J., Reynolds, K.J., 1993. The efficiencey of incomplete contracts: an empirical analysis of Air Force engine procurement. Rand Journal of Economics 24 (1), 126–146.

Daft, R., Bettenhausen, K., Tyler, B., 1993. Implications of top managers' communication choices for strategic decisions. In: Huber, G.P., Glick, W.H. (Eds.), Organizational Change and Redesign. Oxford University Press, New York, NY.

Daft, R.L., Lengel, R.H., 1984. Information richness: a new approach to managerial behavior and organization design. In: Staw, B.M., Cummings, L.L. (Eds.), Research in Organization Behavior, vol. 6. JAI Press, Greenwich, CT, pp. 191–233.

Daft, R.L., Lengel, R.H., 1986. Organizational information requirements, media richness, and structural design. Management Science 32, 554–571.

Dawson, C., April 2001. Machete time: in a cost-cutting war with Nissan, Toyota leans on suppliers. Business Week, pp. 42–43.

Deeds, D.L., Hill, C.W.L., 1998. An examination of opportunistic action within research alliances: evidence from the biotechnology industry. Journal of Business Venturing 14, 141–163.

Dillman, D.A., 2000. Mail and Internet Surveys: The Tailored Design Method. John Wiley, New York.

Doz, Y., 1996. The evolution of cooperation in strategic alliances: initial conditions or learning processes. Strategic Management Journal 17, 55–83.

Dyer, J.H., 1996a. Specialized supplier networks as a source of competitive advantage: evidence from the auto industry. Strategic Management Journal 17, 271–292.

Dyer, J.H., 1996b. Does governance matter? Keiretsu alliance and asset specificity as sources of Japanese competitive advantage. Organization Science 7, 649–666.

Dyer, J.H., 1997. Effect interfirm collaboration: how firms minimize transaction costs and maximize transaction value. Strategic Management Journal 18, 553–556.

Dyer, J.H., Nobeoka, K., 2000. Creating and managing a high-performance knowledge-sharing network: the Toyota case. Strategic Management Journal 21, 345–367.

Dyer, J.H., Singh, H., 1998. The relational view: cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review 23 (4), 660–679.

Fichman, M., Levinthal, D.A., 1991. History dependence and professional relationships: ties that bind. In: Backarach, S.B., TolbertPS, Barley, S.S. (Eds.), Research in the Sociology of Organizations. JAI Press, Greenwich, CT, pp. 470–476.

Frazier, G.L., 1983. Interorganizational exchange behavior in marketing channels. Journal of Marketing 47, 74–75.

Granovetter, M., 1973. The strength of weak ties. American Journal of Sociology 6, 1360–1380.

Granovetter, M., 1985. Economic action and social structure: the problem of embeddedness. American Journal of Sociology 91, 481–510.

Granovetter, M., 1992. Problems of explanation in economic sociology. In: Nohria, N., Eccles, R.G. (Eds.), Networks and Organizations. Harvard Business School Press, Cambridge, MA, pp. 25–56.

Granovetter, M., 1995. Coase revisited: business groups in the modern economy. Industrial and Corporate Change 4 (1), 93–130.

Grant, R., 1996. Prospering in dynamically-competitive environments: organizational capability as knowledge integration. Organization Science 7, 375–387.

Gulati, R., 1995a. Social structure and alliance formation patterns: a longitudinal analysis. Administrative Science Quarterly 40, 619–652.

Gulati, R., 1995b. Familiarity breeds trust? The implications of repeated ties on contractual choice in alliances. Academy of Management Journal 38, 85–112.

Gulati, R., 1999. Network location and learning: the influence of network resources and firm capabilities on alliance formation. Strategic Management Journal 20 (5), 397–420.

Handfield, R.B., Nichols, E. L., 1999. Introduction to supply chain management, Prentice Hall Upper Saddle River, NJ.

Hansen, M.T., 1999. The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits. Administrative Science Quarterly 44 (1), 82–111.

Hayes, R.H., Wheelwright, S.C., 1984. Restoring our Competitive Advantage. John Wiley and Sons, New York, NY.

Helper, S., 1991. Have things really changed between automakers and their suppliers? Sloan Management Review 32, 15–28.

Heide, J., Miner, A.S., 1992. The shadow of the future: effects of anticipated interaction and frequency of contact on buyer–seller cooperation. Academy of Management Journal 35 (2), 265–291.

Hoetker, G., 2005. How much you know versus how well I know you: selecting a supplier for a technically innovative component. Strategic Management Journal 26, 75–96.

Hult, G.T.M., Ketchen, D.J., Slater, S.F., 2004. Information processing, knowledge development, and strategic supply chain performance. Academy of Management Journal 47 (2), 241–253.

Human, S.E., Provan, K., 1997. An emergent theory of structure and outcomes in small-firm strategic manufacturing networks. Academy of Management Journal 40, 368–403.

Inkpen, A.C., Tsang, E.W.K., 2005. Social capital, networks, and knowledge transfer. Academy of Management Review 30 (1), 146–165.

Jones, C., Hesterly, W.S., Borgatti, S., 1997. A general theory of network governance: exchange conditions and social mechanisms. Academy of Management Review 22, 911–945.

Kogut, B., Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science 3, 383–397.

Krause, D.R., Handfield, R.B., Scannell, T.V., 1998. An empirical investigation of supplier development: reactive and strategic processes. Journal of Operations Management 17 (1), 39–58.

Krause, D.R., 1999. The antecedents of buying firms' efforts to improve suppliers. Journal of Operations Management 17 (2), 205–224.

Krause, D.R., Handfield, R.B., 1999. Developing a World-Class Supply Base. Center for Advanced Purchasing Studies, Tempe, AZ.

Krause, D.R., Scannell, T.V., Calantone, R.J., 2000. A Structural analysis of the effectiveness of buying firms' strategies to improve supplier performance. Decision Sciences 31 (1), 33–55.

Krause, D.R., Pagell, M., Curkovic, S., 2001. Toward a measure of competitive priorities for purchasing. Journal of Operations Management 19, 497–512.

Lambert, D.M., Harrington, T.C., 1990. Measuring nonresponse bias in customer service mail surveys. Journal of Business Logistics 11 (2), 5–25.

Lawson, B., Tyler, B.B., Cousins, P.D., 2006. Social capital effects on relational performance improvement: an information processing perspective. Best Paper Proceedings of Academy of Management Conference, August 2006.

Leenders, M.R., 1966. Supplier development. Journal of Purchasing 24, 47–62.

Levinthal, D.A., Fichman, M., 1988. Dynamics in interorganizational attachments: auditor–client relationships. Administration Science Quarterly 33, 345–369.

Liker, J.K., Choi, T.Y., 2004. Building deep supplier relationships. Harvard Business Review 82 (10), 102–112.

Liker, J., Wu, Y., 2000. Japanese automakers U.S. suppliers and supply-chain superiority. Sloan Management Review 42, 81–93.

Lin, F., Huand, S., Lin, S., 2002. Effects of information sharing on supply chain performance in electronic commerce. IEEE Transactions on Engineering Management 49 (3), 258–268.

MacDuffie, J.P., 1995. Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the world auto industry. Industrial and Labor Relations Review 48, 197–221.

MacDuffie, J., Helper, S., 1997. Creating lean suppliers: diffusing lean production through the supply chain. California Management Review 39 (4), 118–151.

Madhok, A., Tallman, S., 1998. Resources, transactions and rents: managing value through interfirm collaborative relationships. Organization Science 9 (3), 326–339.

McEvily, B., Marcus, A., 2005. Embedded ties and the acquisition of competitive capabilities. Strategic Management Journal 26, 1033–1055.

Meredith, R., 2000. Driving to the Internet. Fortune 165 (13), 128–135.

Mitchell, W., Singh, K., 1996. Precarious collaboration: business survival after partners shut down or form new partnerships. Strategic Management Journal 17 (3), 95–115.

Monczka, R., Peterson, K., Handfield, R.B., Ragatz, G., 1998. Determinants of successful vs. non-strategic supplier alliances. Decision Sciences Journal 29 (3), 553–577.

Monczka, R., Handfield, R., Frayer, D., Ragatz, G., Scannell, T., 2000. New Product Development: Supplier Integration Strategies for Success. ASQ Press, Milwaukee, WI.

Moran, P., 2005. Structural vs. relational embeddedness: social capital and managerial performance. Strategic Management Journal 26, 1129–1151.

Nahapiet, J., Ghoshal, S., 1998. Social capital, intellectual capital, and the organizational advantage. Academy of Management Review 23, 242–266.

Nelson, R.R., Winter, S.G., 1982. An Evolutionary Theory of Economic Change. Belknap Press of Harvard University Press, Cambridge, MA.

Nonaka, I., 1994. A dynamic theory of organizational knowledge creation. Organization Science 5, 14–37.

Osborn, R.N., Hagedoorn, J., 1997. The institutionalization and evolutionary dynamics of interorganizational alliances and networks. Academy of Management Journal 402, 261–278.

Parkhe, A., 1993. Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation. Academy of Management Journal 36, 794–829.

Pfeffer, J., Salancik, G.R., 1978. The External Control of Organizations. Harper & Row, New York.

Powell, W.W., 1996. Inter-organizational collaboration in the biotechnology industry. Journal of Institutional and Theoretical Economics 152, 197–225.

Reed, F.M., Walsh, K., 2002. Enhancing technological capability through supplier development: a study of the U.K. aerospace industry. IEEE Transactions on Engineering.

Reuer, J.J., Zollo, M., Singh, H., 2002. Post-formation dynamics in strategic alliances. Strategic Management Journal 23, 135–151.

Ring, P.S., Van de Ven, A.H., 1994. Developmental processes of cooperative interorganizational relationships. Academy of Management Review 19, 90–118.

Sako, M., Helper, S., 1998. Determinants of trust in supplier relations: evidence from the automotive industry in Japan and the United States. Journal of Economic Behavior and Organization 34 (3), 387–417.

Schnake, M.E., Cochran, D.S., 1985. Effects of two goal-setting dimensions on perceived intraorganizational conflict. Group and Organization Studies 10, 168–183.

Seltzer, L., 1928. A Financial History of the United States Automobile Industry. Houghton Mifflin, Boston, MA.

Smock, D., 2001. Deere takes a giant leap. Purchasing 130 (17), 26–35.

Smith, K.G., Carroll, S.J., Ashford, S.J., 1995. Intra and interorganizational cooperation: toward a research agenda. Academy of Management Journal 38, 7–23.

Stern, L.W., Adel, I., El-Ansary, A., 1977. Marketing Channels. Prentice Hall, Englewood Cliffs, NJ.

Stuart, T.E., 1998. Network positions and propensities to collaborate: an investigation of strategic alliance formation in a high-technology industry. Administrative Science Quarterly 43, 668–698.

Stuart, F.I., Decker, P., McCutheon, D., Kunst, R., 1998. A leveraged learning network. Sloan Management Review 39 (4), 81–94.

Swamidass, P.M., Newell, W.T., 1987. Manufacturing strategy, environmental uncertainty and performance: a path analytic model. Management Science 334, 509–524.

Szulanski, G., 1996. Exploring internal stickiness: impediments to the transfer of best practice within the firm. Strategic Management Journal 17, 27–43.

Teece, D.J., 1986. Profiting from technological innovation: implications for integration, collaboration, licensing and public policy. Research Policy 15, 285–306.

Thomas, J.B., Trevino, L.K., 1993. Information processing in strategic alliance building: a multiple-case approach. Journal of Management Studies 30 (5), 779–814.

Thompson, J., 1967. Organizations in Action. McGraw-Hill Book Company, New York.

Tsai, W., Ghoshal, S., 1998. Social capital and value creation: the role of interfirm networks. Academy of Management Journal 41, 464–476.

Turnbull, P., Oliver, N., Wilkinson, B., 1992. Buyer–supplier relations in the UK automotive industry: strategic implications of the Japanese manufacturing model. Strategic Management Journal 13, 159–168.

Tyler, B., 2001. The complementarity of cooperative and technological competencies: a resource-based perspective. Journal of Engineering and Technology Management 18, 1–27.

Uzzi, B., 1997. Social structure and competition in interfirm networks: the paradox of embeddedness. Administrative Science Quarterly 42, 35–67.

Walker, G., Kogut, B., Shan, W., 1997. Social capital, structural holes and the formation of an industry network. Organization Science 8 (2), 109–125.

Ward, P.T., Leong, G.K., Snyder, D.L., 1990. Manufacturing strategy: an overview of current process and content models. In: Ettlie, J.E., Burstein, M.C., Fiegenbaum, A. (Eds.), Manufacturing Strategy: The Research Agenda for the Next Decade, Proceedings of the Joint Industry University Conference on Manufacturing Strategy, Ann Arbor, Michigan, pp. 189–199.

Ward, P., McCreery, J.K., Ritzman, L.P., Sharma, D., 1998. Competitive priorities in operations management. Decision Sciences 29 (4), 1035–1046.

Weick, K.E., 1995. Sensemaking in Organizations. Sage, London.

Wernerfelt, B., 1995. The resource-based view of the firm: ten years after. Strategic Management Journal 16, 171–175.

Williamson, O.E., 1985. The Economic Institutions of Capitalism: Firms, Markets Relational Contracting. The Free Press, New York.

Womack, J.P., Jones, D.R., Roos, D., 1990. The Machine That Changed the World. HarperCollins, New York.

Zaheer, A., McEvily, B., Perrone, V., 1998. Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance. Organization Science 9 (2), 141–159.

Zaheer, A., Venkatraman, N., 1995. Relational governance as an interorganizational strategy: an empirical test of the role of trust in economic exchange. Strategic Management Journal 19 (5), 373–392.

Zajac, E.J., Olsen, C.P., 1993. From transaction cost to transactional value analysis: implications for the study of interorganizational strategies. Journal of Management Studies 30, 131–214.